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Tilting mode relaxation and oxygen isotope effect in La 2-xSrxCuO4 studied by electron paramagnetic resonance

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Abstract

The electron paramegnetic resonance (EPR) of Mn2+ doped into La2-xSrxCuO4 was used to probe the copper spin relaxation via the bottleneck effect for oxygen isotope (16O and 18O)-substituted samples. It was found that the EPR linewidth is larger for the 18O isotope samples than for the 16O samples. For x = 0.03, the linewidth for the 18O sample is larger than for 16O sample by a factor of 2. The isotope effect is pronounced at low temperatures and decreases with increasing Sr concentration. This effect is quantitatively explained by the Cu2+ S = 1/2 spin relaxation to the lattice via Dzyaloshinski terms coupled linearly to the local Q4/Q5 tilting modes of the CuO6 octahedra as proposed by Kochelaev et al. [1] The Q4/Q5 modes are coupled sterically to the Q2 Jahn-Teller modes considered to be relevant for the (bi)-polaron formation and thus for the high-temperature superconductivity (HTSC). © 2000 Plenum Publishing Corporation.

Keywords

EPR, Isotope effect, LSCD